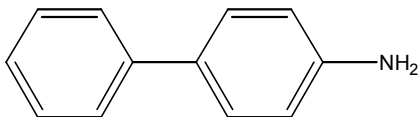


4-AMINOBIPHENYL (4-AMINODIPHENYL)

CAS No. 92-67-1

First Listed in the *First Annual Report on Carcinogens*



CARCINOGENICITY

4-Aminobiphenyl is *known to be a human carcinogen* based on sufficient evidence of carcinogenicity in humans (IARC V.1, 1972; IARC S.1, 1979; IARC S.4, 1982; IARC S.7, 1987). The extent of urinary bladder cancer risk associated with exposure to 4-aminobiphenyl was first documented by a descriptive study in which 19 of 171 men exposed to the compound developed urinary bladder tumors. In another survey of cancer mortality among workers at a chemical plant producing a variety of chemicals, a tenfold increase in mortality from urinary bladder cancer was reported.

An IARC Working Group reported that there is sufficient evidence of carcinogenicity of 4-aminobiphenyl in experimental animals (IARC V.1, 1972; IARC S.1, 1979; IARC S.4, 1982; IARC S.7, 1987). When administered by gavage, 4-aminobiphenyl induced carcinoma of the urinary bladder in mice and rabbits. When administered in the diet, 4-aminobiphenyl induced neoplasms at various sites, including dose-related increases in the incidence of angiosarcomas, in mice. When administered in the diet, the compound induced carcinoma of the urinary bladder in dogs. When administered by subcutaneous injection, 4-aminobiphenyl induced mammary gland and intestinal tumors in rats and hepatomas in newborn mice of both sexes.

PROPERTIES

4-Aminobiphenyl occurs as colorless crystals which turn purple upon oxidation. It has a floral odor. It is slightly soluble in cold water and soluble in hot water, non-polar solvents, and lipids. When heated to decomposition, it emits toxic fumes of nitrogen oxides (NO_x).

USE

4-Aminobiphenyl presently has no commercial use in the United States, although it was formerly used as a rubber antioxidant and a dye intermediate (HSDB, 1997). The compound has also been used as a research chemical and as a reagent for detecting sulfates (Merck, 1983; Sittig, 1985).

PRODUCTION

4-Aminobiphenyl is no longer produced commercially in the United States, as is the case in most countries of the world, because of its carcinogenic effects (HSDB, 1997). Current 1998 editions of Chemcyclopedia and the Chemical Buyers Directory identified no domestic suppliers of the chemical (Rodnan, 1997; Tilton, 1997). The 1979 TSCA Inventory identified one producer

of 4-aminobiphenyl in 1977, but no volume was reported. From 1975 through 1977, EPA reported only one producer of 4-aminobiphenyl (TSCA, 1979).

EXPOSURE

The primary routes of potential human exposure to 4-aminobiphenyl are dermal contact, ingestion, and inhalation. Consumers could possibly be exposed by ingesting foods with food additives containing trace amounts of 4-aminobiphenyl as a contaminant. The chemical has also been found in tobacco smoke (HSDB, 1997). Mainstream cigarette smoke is reported to contain 4.6 ng/cigarette of 4-aminobiphenyl, while sidestream smoke contains 140 ng/cigarette of the chemical (Patrianakos and Hoffmann, 1979). Current studies have focused on the relationship between exposure to environmental tobacco smoke and levels of hemoglobin (Hb) adducts of 4-aminobiphenyl in pregnant women. Nonsmokers in one study were found to have 14% as much 4-aminobiphenyl-Hb adduct as smokers (Hammond et al., 1993). The mean level among fifteen pregnant smokers was 184 pg/g, while that for forty pregnant nonsmokers was 22 pg/g. A direct relationship was observed between environmental tobacco smoke exposure and both the median and mean 4-aminobiphenyl-Hb adduct levels in nonsmokers. In addition, the results showed a statistically significant relationship between the weekly average exposure to environmental tobacco smoke during the third trimester of pregnancy and the levels of 4-aminobiphenyl-Hb adducts found at the time of delivery. Through chromatographic techniques, significantly elevated levels of 4-aminobiphenyl-Hb adducts have been detected in maternal smokers and the corresponding fetal blood samples compared to nonsmokers, with a strong correlation between maternal and fetal exposures to 4-aminobiphenyl (Pinorini-Godly and Myers, 1996). The study thus confirms the ability of the potent tobacco-related carcinogen to cross the placenta and bind to fetal hemoglobin. Also, mainstream cigarette smoke is reported to contain 4.6 ng/cigarette of 4-aminobiphenyl, while sidestream smoke contains 140 ng/cigarette of the chemical (Patrianakos and Hoffmann, 1979).

Today, exposure to 4-aminobiphenyl in the workplace is slim, since it is no longer commercially manufactured (HSDB, 1997). 4-Aminobiphenyl, however, occurs as a contaminant in 2-aminobiphenyl, which is used in the manufacture of dyes. OSHA estimated that approximately 130 workers are possibly exposed to 4-aminobiphenyl during the production of 2-aminobiphenyl. The Toxic Chemical Release Inventory (EPA) listed one industrial facility that produced, processed, or otherwise used 4-aminobiphenyl in 1988 (TRI, 1990). In compliance with the Community Right-to-Know Program, the facilities reported releases of 4-aminobiphenyl to the environment which were estimated to total 14 lb.

REGULATIONS

In 1980, CPSC preliminarily determined that 4-aminobiphenyl was not present in consumer products under its jurisdiction. CPSC subsequently requested public comment to verify the accuracy of its information, but no comments were received. Pending the receipt of new information, CPSC plans no action on 4-aminobiphenyl. EPA regulates 4-aminobiphenyl under the Resource Conservation and Recovery Act (RCRA) as a hazardous constituent of waste and under Title III of Superfund Amendments and Reauthorization Act (SARA). A reportable quantity (RQ) of 1 lb (0.454 kg) has been established for the compound. FDA, under the Food, Drug, and Cosmetic Act (FD&CA), regulates 4-aminobiphenyl as a contaminant in food and color additives. FDA has published a listing of color additives certified for external uses, and regulates the level of 4-aminobiphenyl as a contaminant in these color additives. NIOSH recommends the lowest feasible concentration as the exposure limit. OSHA regulates 4-

aminobiphenyl as a carcinogen with potential for occupational exposure. It has issued a final standard requiring the use of exhaust fans, protective clothing, and respirators in work places where there is potential for exposure to 4-aminobiphenyl. OSHA, in addition, regulates 4-aminobiphenyl as a chemical hazard in laboratories under the Hazard Communication Standard. Regulations are summarized in Volume II, Table A-3.